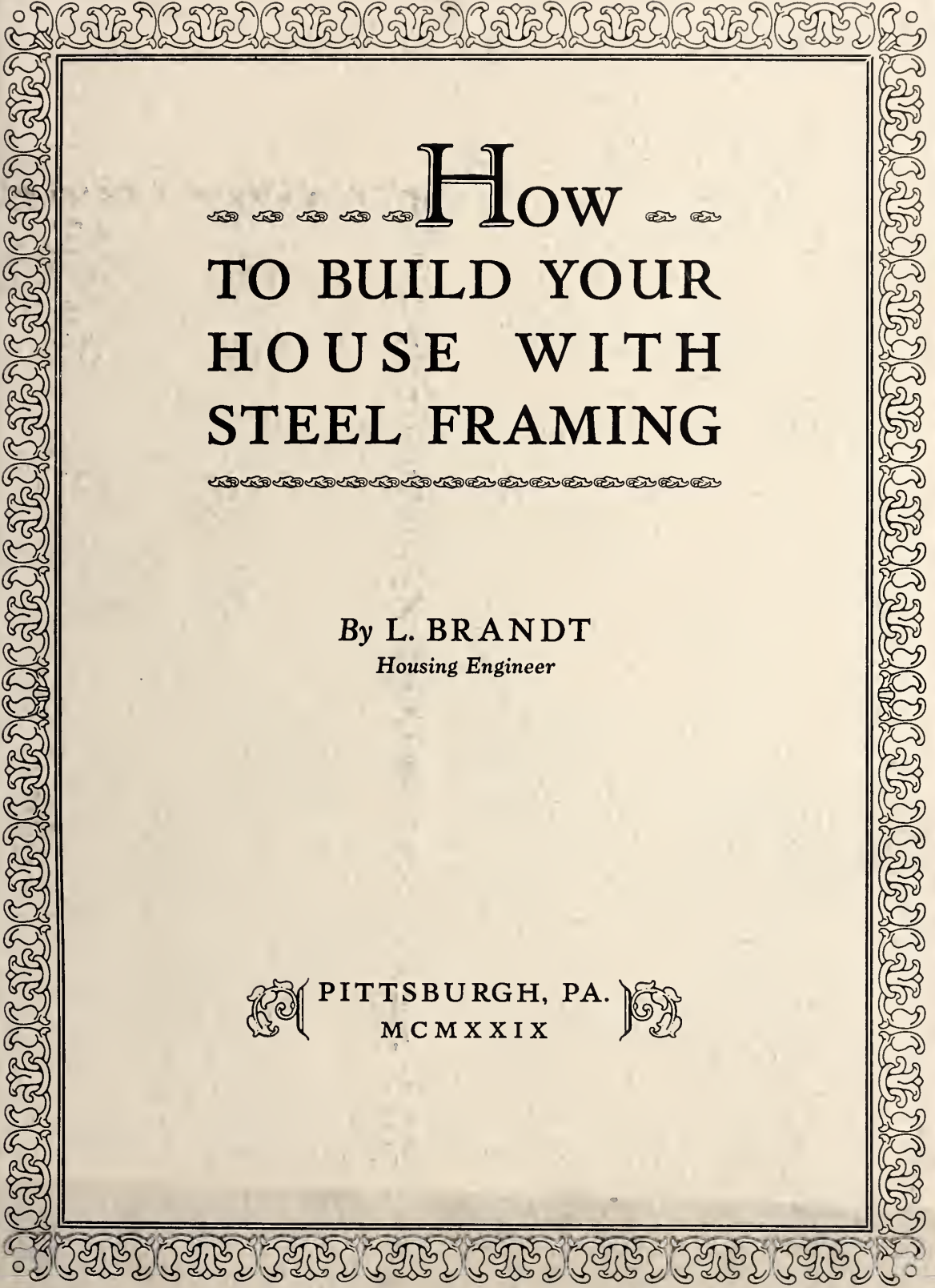




4-11
12



How TO BUILD YOUR HOUSE WITH STEEL FRAMING

By L. BRANDT
Housing Engineer

 PITTSBURGH, PA. 
MCMXXIX



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This

House will

Stand Forever

*Strong
Durable
Fireproof
Non-
Shrinkable*



**STEEL FRAMING
FOR DWELLINGS**

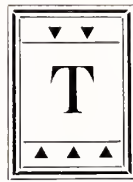
THE "Steel Framed" House is rigid and enduring, - it cannot settle, sag or shrink as do ordinary framed houses. It has all the advantages of permanence and fire safety which houses framed with other materials lack.

By means of the steel units as developed by this Company, - any house of any architectural design can be easily and quickly framed with steel. Our booklet "Steel Framing for Dwellings" describes this unique system of house construction in detail - a copy will be sent on request.

**Steel Frame House
Company**

PITTSBURGH, - - - PA.

P R E F A C E



THE information given in the pages of this booklet of *How to Build your House with Steel Framing*, was prepared by the author after having an intimate contact with the Steel Frame House Company's system of framing since its inception. The writer had the opportunity to prepare construction details, place contracts and supervise the construction of one of the early demonstration houses using this system of framing. The information given herein was obtained not only in this practical experience but also in placing contracts and observing the handling of steel frame house construction in many sections of the country



How to Build your House with Steel Framing

By L. Brandt, Housing Engineer,
Pittsburgh, Pa.

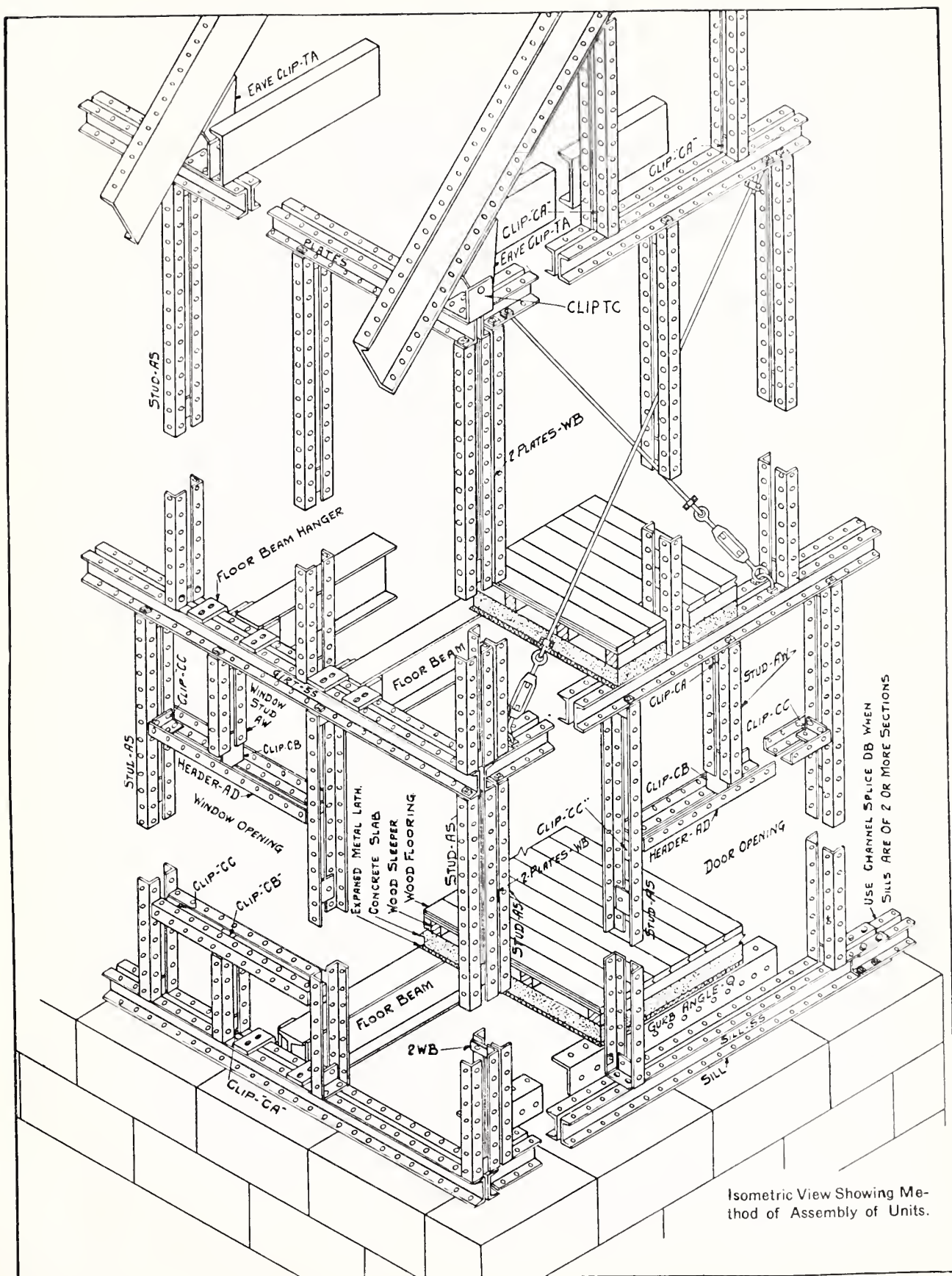


INTRODUCTION



APPRECIATING the fact that steel for years has been a leading structural material, architects and engineers have for a long time been trying to perfect a simple and rapid method for the erection of houses with steel framing. Many attempts were made to employ steel by applying the plan of skyscraper framing, but not until the Steel Frame House Company of Pittsburgh, Penna., a subsidiary of the McClintic-Marshall Corporation, the largest independent fabricators in the world, developed the system of steel framing along lines using the same practices followed in wood framing, in which steel replaces the wood sills, girts, plates, studs, joists, and rafters and made up so complete in detail that the steel is fabricated at the shop and delivered to the building site ready for assembly without cutting or fitting, was steel framing made practical for house construction. The Steel Frame House Company's system uses standard hot rolled Copper Bearing steel sections employing light angles for studs, corner posts and lintels around openings. By the use of separation plates two angles are joined together making the finished stud $1\frac{1}{2}'' \times 3\frac{3}{4}''$. By making the stud in this manner the space between the two angles permits openings sufficient for bracing, wiring and piping. Horizontal members include sills, girts, and plates which are built up of standard channels. Floor joists are made of light steel I-beams or channels and rafters are made of channels. All members except floor joists are perforated along the flange with $\frac{7}{16}''$ holes spaced 2'' on center. This perforation is a feature of the system as it permits quick assembly within a maximum dimensional limitation of 2'' in any direction. Of great importance to the owner is the fact that the system of framing is so flexible that a house may be planned without restriction in its arrangement or style by limitations which have heretofore prevented the economic use of steel for structural purposes in house construction. Architects are able to carry out their ideas in planning houses as to space requirements and architecture with the same ease with which they are accustomed to designing houses in other constructions.

The framing is always erected in a relatively short time. One of the most outstanding achievements proven in demonstration is the fact that the steel framing was so developed for flexibility not only for design but that other standard materials employed in fireproof construction are used in contact with the steel framing with no more difficulty and at no greater cost than when they are employed with other construction. Mechanics wholly unfamiliar with the new system of construction have completed steel frame houses without preliminary directions and with only the normal amount of supervision after the special methods which have been developed are once demonstrated by the Steel Frame House Company's engineers.



General Description



THE Steel Frame House Company's construction is placed upon foundations the same as you would build for any other house, except that the sill sections are attached to the foundations with anchor bolts. The studs being the same width as standard wood framing are set back from the face of the foundation wall to allow one course of brick or stone for exterior work. Stone is now obtainable in many sections of the country for exterior work that conforms to the dimensions occupied for brick veneer. Stucco may also be used as an exterior finish.

As soon as the steel framing is raised, a self-forming electric welded heavy wire mesh reinforcement is placed over the floor joists, then wood floor sleepers are placed with sleeper chairs in their proper location, after which a cement slab $1\frac{1}{2}$ " to 2" thick is poured around and under the floor sleepers. The cement slab not only furnishes a fire stop but supports the floor sleepers which are now ready for finished wood flooring or any other material such as cork, linoleum rubber or tile.

Windows placed in the steel framing can be casement or double hung in wood, steel or aluminum, and are attached to wood bucks set in mastic which makes them weather-tight.

The roughing in for plumbing and heating is usually started as soon as the steel framing is raised. Provision is made in the framing for the large pipes such as soil stacks, closet bends, etc. The smaller pipes such as waste lines and heating lines where run horizontal with floor system can be placed in the space between the top of the cement slab and the under side of flooring which is sufficient for the purpose.

Electric wiring is installed with armored cable and outlet boxes all of which are easily and inexpensively attached to steel framing. The labor costs in this system of wiring is less than knob and tube work as used in other construction.

When the cement slab has been poured and the windows set in the steel framing we are then ready to construct the exterior walls of brick, stone or stucco.

The exterior walls are first covered with a wire mesh with a tough fibrous backing or with an insulating board. The stone or brick work is laid in the usual manner the same as brick or stone veneer work, except that when using the wire mesh with fibrous backing for sheathing the brick is spaced one inch from the mesh and the space between the brick and mesh is filled with the cement mortar (the same as used in laying up the brick) and put in as the brick are laid, thus forming a reinforced cement slab which becomes bonded to the fibrous backing. The brick becomes bonded to the slab and the cement mortar works thoroughly into all the joints of the brick as well as around all window and door openings and makes a leak-proof wall. This construction has proven its insulation value by preventing the penetration of moisture or infiltration of air.

After brick work has been completed, cornice is placed and roofing laid and when the building is enclosed, plastering and other finishing work is carried out in the same manner as other construction.

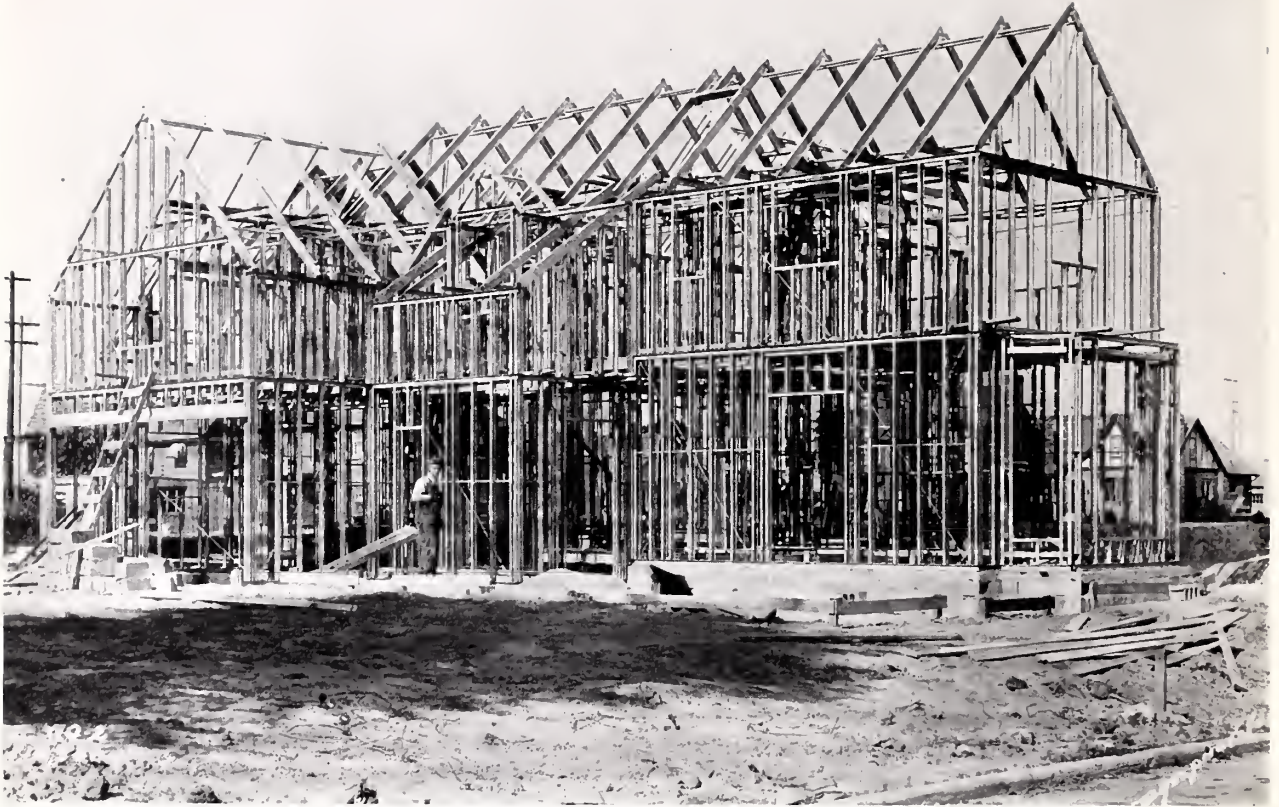


Completed 7-room dwelling erected in Washington, D. C.



Lancaster, Pa.

Construction



Steel Frame House, Northeast corner Pennsylvania & Fifty-seventh Streets, Indianapolis, Indiana.

Photograph taken twelfth day after starting steel structure.

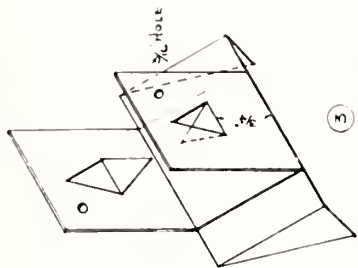


DETAILED steel framing plans are furnished for erection purposes. Foundations are constructed according to plans for this part of the work. Anchor bolts are placed in a definite location from the outside face of the wall but spacing between anchor bolts may vary. Then the steel framing is placed in much the same manner as wood framing: sills shall be set level and imbedded in cement mortar. Girders and first floor joists are placed as indicated on framing plans.

First story studding for outside and interior partition bearing walls are raised. Girt sections which act as plates for first story framing makes the first story complete. Second floor joists are placed and then follows the second



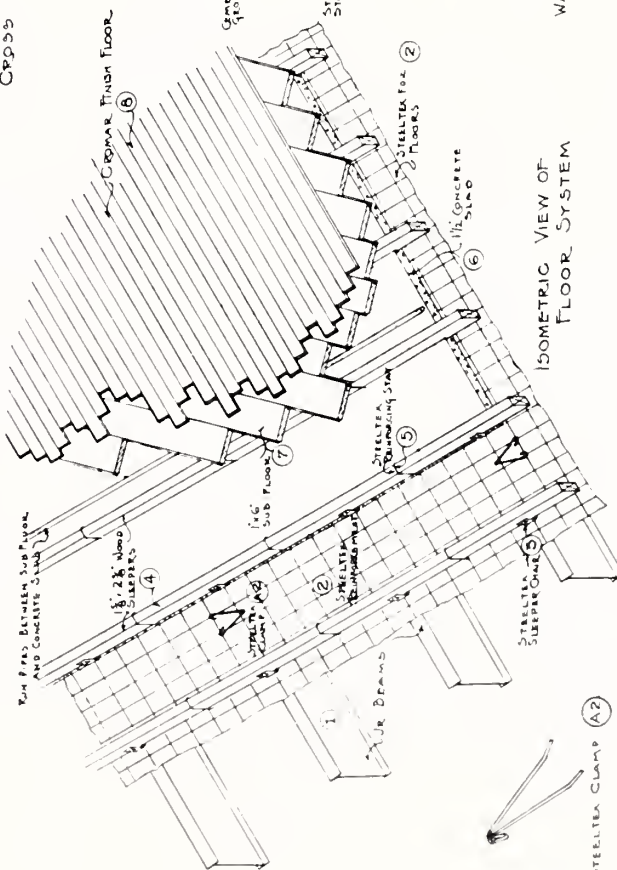
2nd floor framing residence on Scottdale Boulevard, Shaker Heights



LONGITUDINAL SECTION

$\Delta = 1.0$

FROM PAPA BATTLEM SUBPAPA



ISOMETRIC VIEW OF
FLOOR SYSTEM

STEELTEN CLAMP (A2)

CROSS SECTION.

STEELTEX SLEEPER CHAIR
FULL SIZE

STEELER REINFORCING STAY
FULL SIZE

0000

- [illegible]

WALL & FLOOR SECTION AT FOUNDATION
SCALE 3" = 1'-0"

24

S.F.H.

STEELTEX FLOOR DETAILS FOR STEEL FRAME HOUSE CONSTRUCTION -

L BRANDT HOUSING ENGINEER -
PITTSBURGH PA JUNE 1.29

story framing. When the second story framing is completed, the roof rafters are raised. After wind bracing has been installed throughout framing is complete and ready for remaining construction work.

The floor system is constructed with $1\frac{1}{2}$ " or 2" thickness cement slab over a self-forming reinforcement placed on the steel joists. Wood sleepers are placed 16" on center imbedded in the cement slab. Note details, (page 7) following description:—

Unit No. 1: Junior Beam joists provided in steel framing.

Unit No. 2: STEELTEX reinforcement for floors placed in full lengths across entire floor system from the outer walls of rooms, fastened in place to Junior beams with special STEELTEX clamps Unit No. A-2.

Unit No. 3: STEELTEX sleeper chairs to be attached to floor sleeper in their proper location to fit over floor beam before sleepers are set in place.

Unit No. 4: Wood floor sleepers spaced 16" on center, $1\frac{5}{8}$ " x $2\frac{5}{8}$ ", sized exactly in depth, ripped from 2 x 6" commercial yellow pine, fir, spruce, or hemlock framing lumber.

Unit No. 5: STEELTEX reinforcing stay support hooked under main member wires of the STEELTEX floor reinforcement (Unit No. 2) in sufficient quantity to support floor reinforcement without sagging.

Unit No. 6: Cement slab sub-floor, 1 part cement, $2\frac{1}{2}$ parts clean sharp sand and 3 parts pea gravel or stone screenings.

Unit No. 7: 1 x 4" or 1 x 6" 13/16" wood sub-flooring surfaced to even thickness yellow pine, spruce, or hemlock, placed diagonally at 60 degrees over wood floor sleepers.

Unit No. 8: Cromar factory-finished oak flooring, in grade and finish as may be desired, laid according to manufacturer's printed directions.

The basis for figuring the cost of cement slab over steel joists, placing floor slab, etc., is as follows:

Labor laying self-forming reinforcement—100 sq. ft. per one man hour.

Placing cement slab— $3\frac{1}{2}$ cubic ft. of concrete per one man hour.

Placing floor sleepers, chairs and stays—60 lin. ft. of floor sleeper per one man hour.

Cement slab is composed of 1 part cement, $2\frac{1}{2}$ parts clean sharp sand and 3 parts pea gravel or stone screenings.

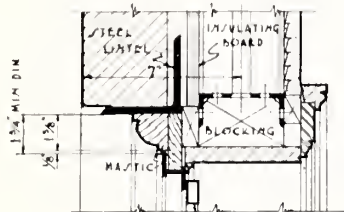
The floor sleepers are spaced 16" on center, $1\frac{5}{8}$ " x $2\frac{5}{8}$ " ripped from 2 x 6" commercial yellow pine, fir, spruce or hemlock framing lumber.

Placing Outside Doors and Windows

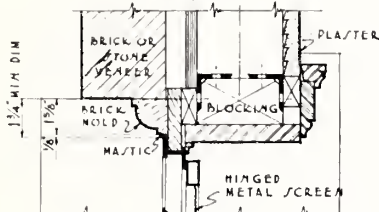
Outside doors and windows are now placed (Note following details). Wood bucks, yellow pine, spruce, or white pine, secured in steel framing by nailing to wood blocks placed between flange of studs. White pine hanging strips attached to steel sash with screws and imbedded in mastic to hanging strip. White pine reveal mould backpainted and placed after sash have been secured to hanging strip and to wood buck.

Windows

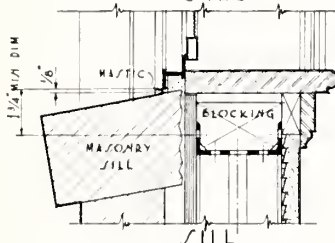
Double hung wood, steel or aluminum windows may be easily placed in the steel framing as shown by the following details.



HEAD

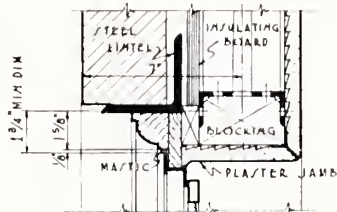


JAMB

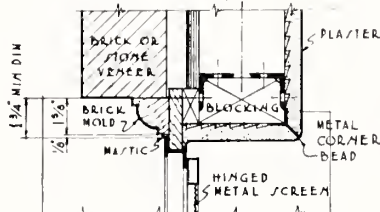


SILL

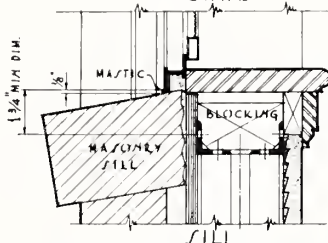
STEEL CASEMENT WINDOW
BRICK OR STONE VENEER CONSTRUCTION
WITH BRICK MOLD & WOOD TRIM



HEAD

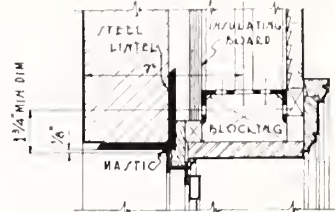


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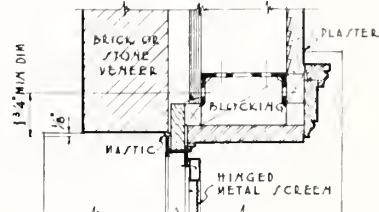


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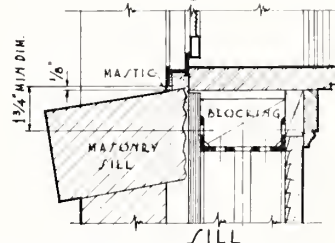
STEEL CASEMENT WINDOW
BRICK OR STONE VENEER CONSTRUCTION
WITH BRICK MOLD & PLASTER JAMBS



HEAD

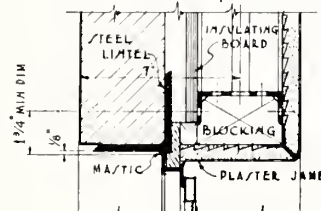


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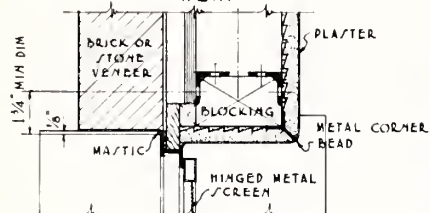


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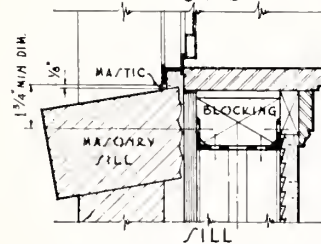
STEEL CASEMENT WINDOW
BRICK OR STONE VENEER CONSTRUCTION
WITH WOOD TRIM



HEAD

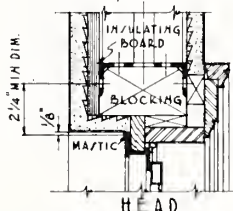


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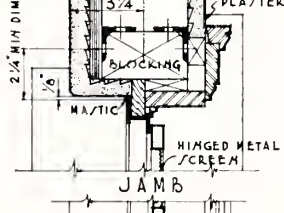


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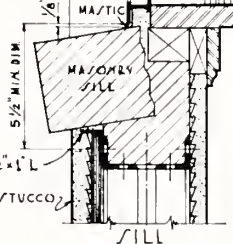
STEEL CASEMENT WINDOW
BRICK OR STONE VENEER CONSTRUCTION
WITH PLASTER JAMBS



HEAD

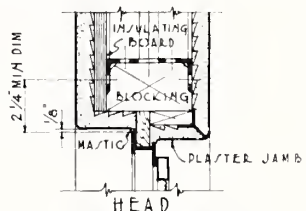


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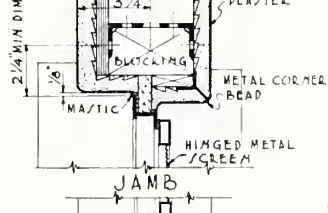


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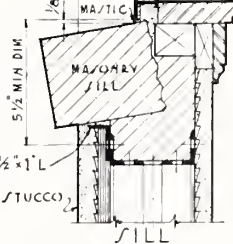
STEEL CASEMENT WINDOW
STUCCO CONSTRUCTION
WITH WOOD TRIM



HEAD



JAMB



SILL

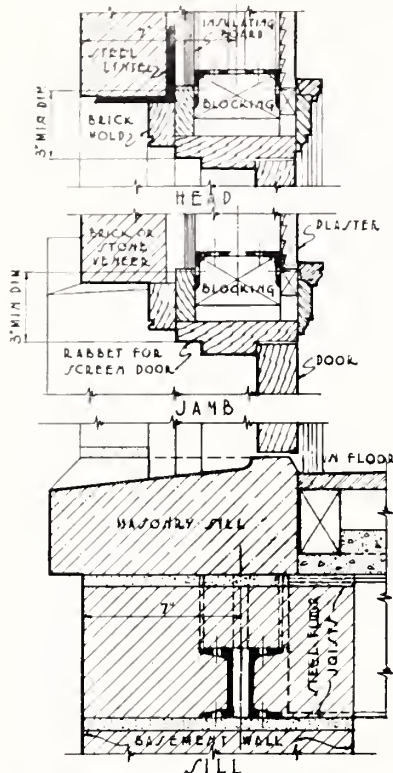
STEEL CASEMENT WINDOW
STUCCO CONSTRUCTION
WITH PLASTER JAMBS

NOTE:-
MINIMUM
CLEARANCE
DIMENSIONS
ARE GIVEN TO
GAGE LINES
OF STEEL
FRAMING.

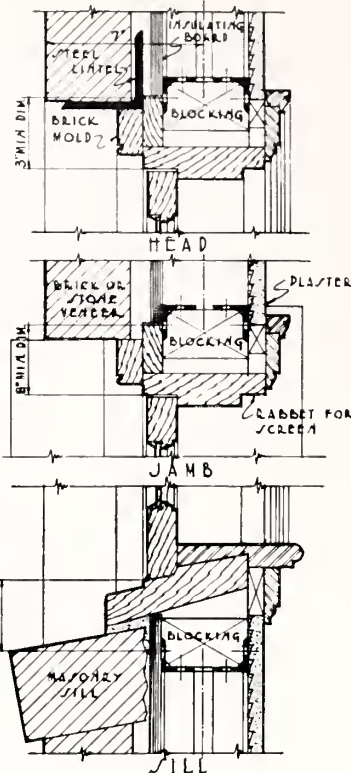
STEEL CASEMENT WINDOW DETAILS STEEL FRAME HOUSE CO. PITTSBURGH, PA.

DRAWING
NUMBER

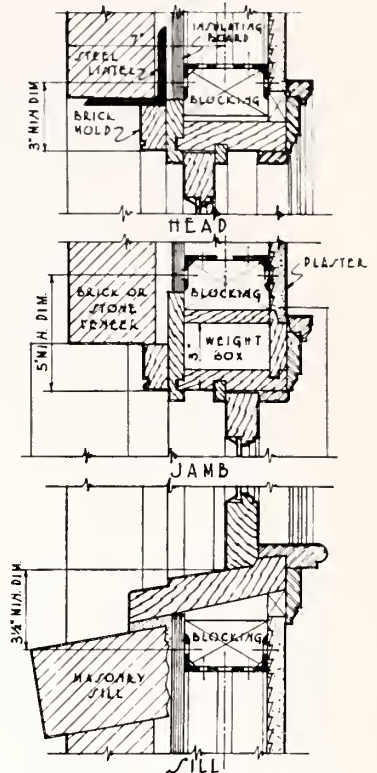
SCALE - 1/2 IN.
EQUALS 1 FT.



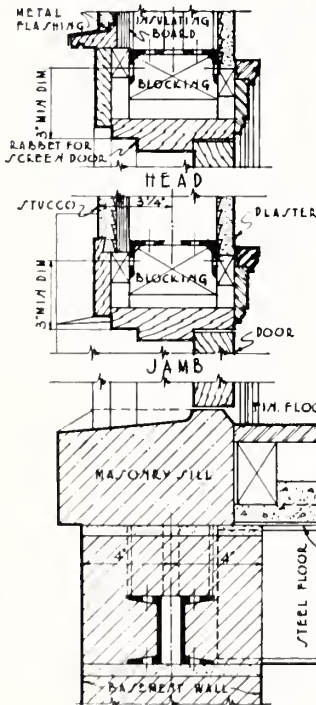
· EXTERIOR · DOOR ·
· BRICK OR STONE VENEER CONSTRUCTION ·



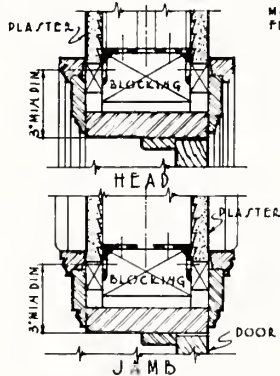
· WOOD · CASEMENT · WINDOW ·
· BRICK OR STONE VENEER CONSTRUCTION ·



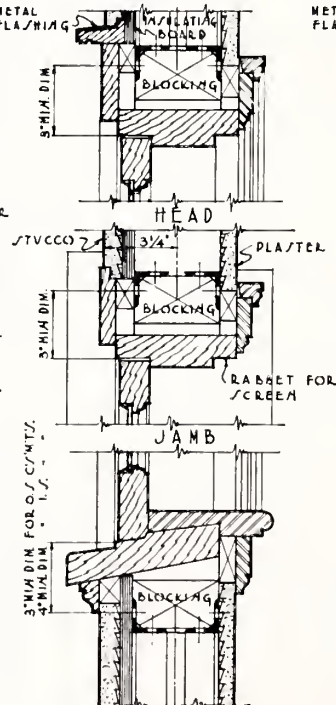
· DOUBLE · HUNG · WINDOW ·
· BRICK OR STONE VENEER CONSTRUCTION ·



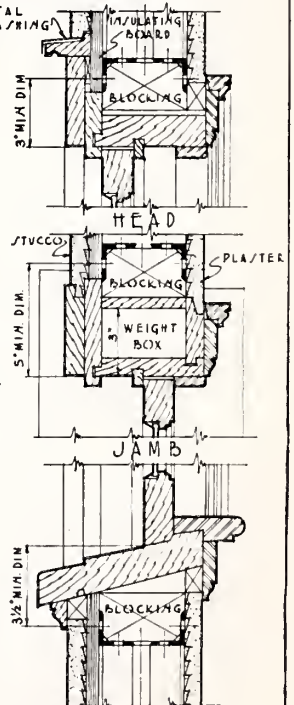
· EXTERIOR · DOOR ·
· STUCCO CONSTRUCTION ·



· INTERIOR · DOOR ·



· WOOD · CASEMENT · WINDOW ·
· STUCCO CONSTRUCTION ·



· DOUBLE · HUNG · WINDOW ·
· STUCCO CONSTRUCTION ·

NOTE! - MINIMUM
CLEARANCE DIMEN-
SIONS ARE GIVEN
TO GAGE LINES OF
STEEL FRAMING.

WOOD DOOR & WINDOW DETAILS

STEEL FRAME HOUSE CO. PITTSBURGH, PA.

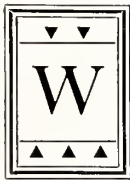
DRAWING
NUMBER

SCALE-1 1/2 IN.
EQUALS 1 FT.



Laying exterior brick with cement backing

Exterior Wall Covering



ALL sheathing may be advantageously placed from bricklayer's scaffold. Exterior walls over steel studding may be sheathed with any gypsum or fibrous insulating sheathing boards. This type of sheathing is attached to the stud through the holes in flanges of stud with special clips made for the purpose. In case of using electric welded mesh with fibrous backing for sheathing, an attachment stay as shown by following details called Unit No. 9 is placed on inside of stud. The sheathing is then attached to stud by pushing the prong of attachment stay through fibrous backing and bending over main reinforcement wires. The brick or stone exterior is placed to allow a one inch space between the reinforcement and the back of brick or stone work and is filled in with cement mortar same as used in laying the brick or stone work. This mortar forming one inch cement slab is spaded down with bricklayer's trowel as each course of brick is laid.

The basis for estimating the cost of bricklaying and forming cement slab is as follows:

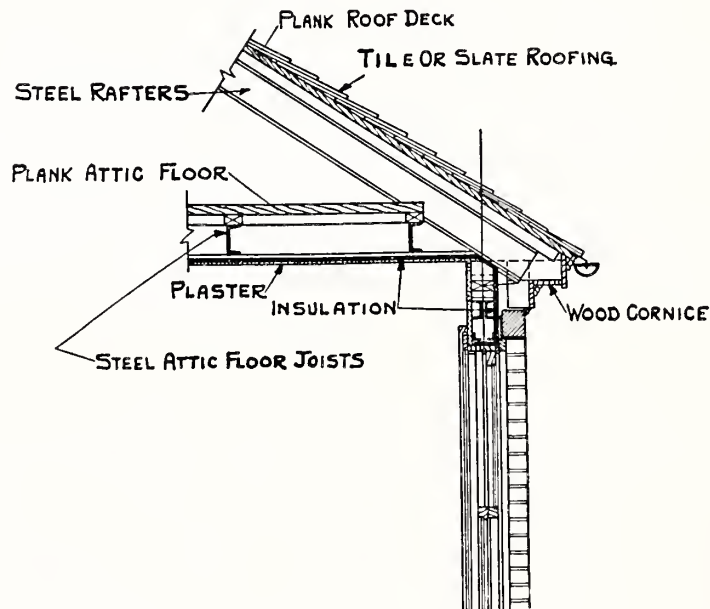
Sand $\frac{3}{4}$ ton for each 1000 brick laid.

Cement 2 bbls. for each 1000 brick laid.

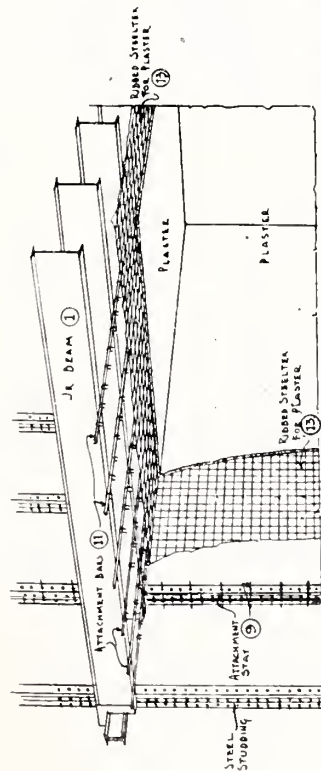
Bricklaying—500 brick for each bricklayer in 8 hours.

Where stucco occurs the welded mesh fabric the same as used for sheathing under brick work, provides a suitable stucco base.

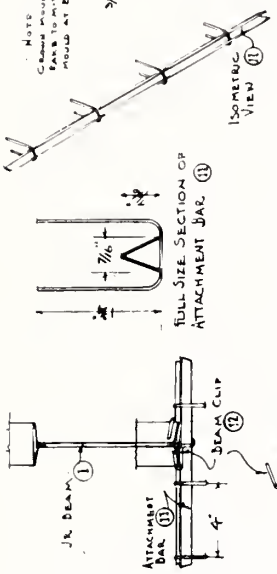
Cornice



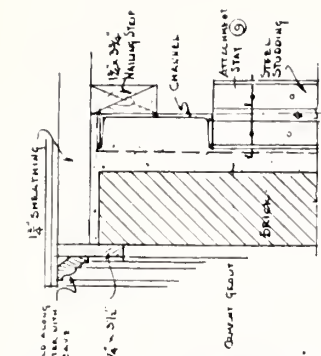
After brick or stone work has been completed,
cornices are attached with wood lookouts.
(See typical details).



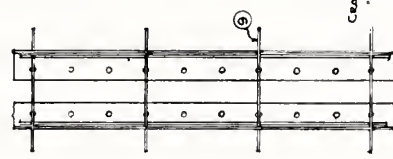
ISOMETRIC VIEW OF INTERIOR
SHOWING CEILING AND WALL CONSTRUCTION -



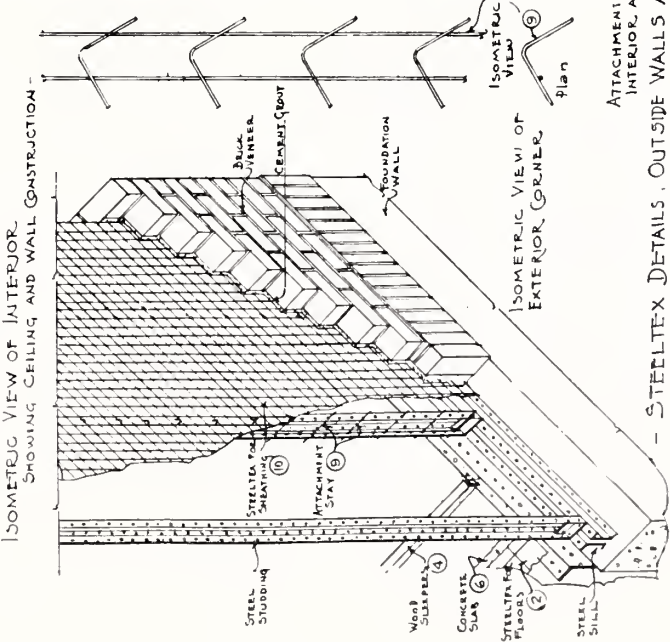
ATTACHMENT BAR AND BEAM CLIP FOR STEEL FRAMING CEILINGS -



DETAIL THRO EAVES OF CORNICE -
SCALE 3\"/>



ATTACHMENT STAY
STRAIGHTENED OUT IN STUD.
2ND OPERATION
STRAIGHTENED OUT.
1ST OPERATION
AS FURNISHED



ATTACHMENT STAY FOR STEEL FRAMING
INTERIOR AND EXTERIOR SIDE WALLS

STEELTEX DETAILS, OUTSIDE WALLS AND INTERIOR PLASTER FOR STEEL FRAME HOUSE CONSTRUCTION -

NOTES

Unit No. 5: Find attachment stay placed as listed of size for attaching exterior STEELTEX sheathing and interior ribbed STEELTEX lathing for plaster.

Unit No. 10: STEELTEX for sheathing secured to stud stays by pushing the prongs of attachment stay through fibre backing and bonding over with reinforcing wire.

Unit No. 11: Attachment bar for bowing STEELTEX on ceiling placed 12" on center secured to battens (Unit No. 12).

Unit No. 12: Same clip for securing attachment bar to ceiling of steel finisher.

Unit No. 13: Ribbed STEELTEX for interior plastering for exterior STEELTEX sheathing. This material is applied by pushing and attachment stay prongs (Unit No. 5) through lathing backing and bonding over and securing with interior wire of STEELTEX.

Unit No. 14: Attachment stay for interior plastering of attachment bar (Unit No. 11) pushing prongs of attachment bar through fibre backing, bonding prongs to edge of rib of main reinforcing wire.

Roofing

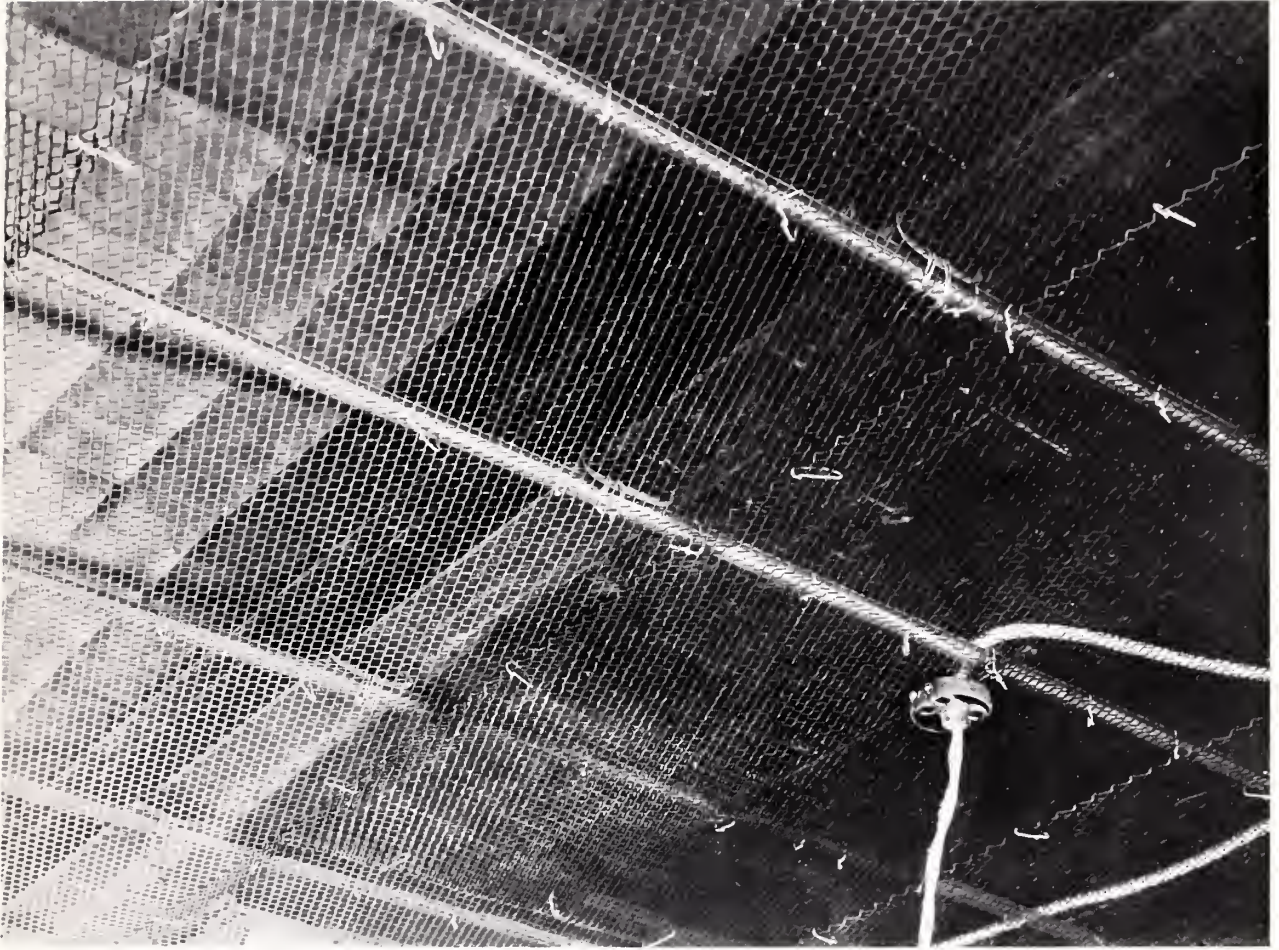


Residence, Brayburn Place, Pittsburgh, Pa.

Roofs are sheathed with 2 inch dressed commercial framing material in 2 x 6, 8 or 10" width nailed to wood strips which have been attached to side of rafters. Any desired roofing material and sheet metal is then placed in the regular way.

Good roofing material and durable sheet metal should always be used. Roofing of tile, aluminum shingles, slate and rigid asbestos shingles laid American method can be placed over the steel rafter and wood sheathing construction in the regular way. Due to the durability of Steel Frame construction the builder is justified in the use of copper, zinc, aluminum or other enduring materials for sheet metal work.

Interior Work



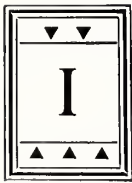
Bellerue House

After building has been roofed, first wiring should be completed and all roughing in for plumbing and heating should be done by this time. The carpenter is now ready to place the wood bucks for interior doors, grounds for base, picture mould, or any furring that is required for attaching finished woodwork. Grounds are secured to wood blocks placed between the flange of studding. These wood blocks can be taken from standard 2 x 4" material and in such lengths as are necessary to accommodate the grounds. If wood sub-flooring is used under finished wood flooring it shall now be laid over wood floor sleepers.

Lathing and Plastering



Bellevue House

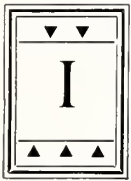


INTERIOR plaster may be placed on any suitable plaster base the same as used in wood frame construction. (Wood lath excepted). Where metal lath or ribbed wire mesh with fibrous backing is used, the attachment stays shown in former detail Unit No. 9, (page 13) can be placed in studs for attaching purposes, pushing the lath over the prongs and bending same over the face of lath to hold in place. Ceiling lath is attached to steel joist with attachment bar (Unit No. 11) shown in former details, (page 13). This attachment bar is secured to flange of joist with beam clip Unit No. 12, (page 13). The prong on the attachment bars are bent over the face of the lath.

Tile Work

Tile work is put up in the usual manner over metal lath and cement backing. Floor tile is supported on the cement slab and where tile floors occur the wood sleepers are not used and the cement slab is formed to a thickness to bring about the desired level with finished wood floors.

Interior Finish



INTERIOR finishing of wood work, painting, installing plumbing fixtures, heating, finished wiring, etc., are carried on in the same manner as any other construction. The following specimen progress chart outlines the steps to be taken in the order set forth for building the steel frame house, and assuming that the steel framing was raised on June 1st., other dates may be established for other parts of the work to be completed and outlines that a steel frame house can be erected complete including foundation in less than 100 days.



*Shaffer House, Mission Hills,
Mount, Lebanon,
Pittsburgh, Pa.*



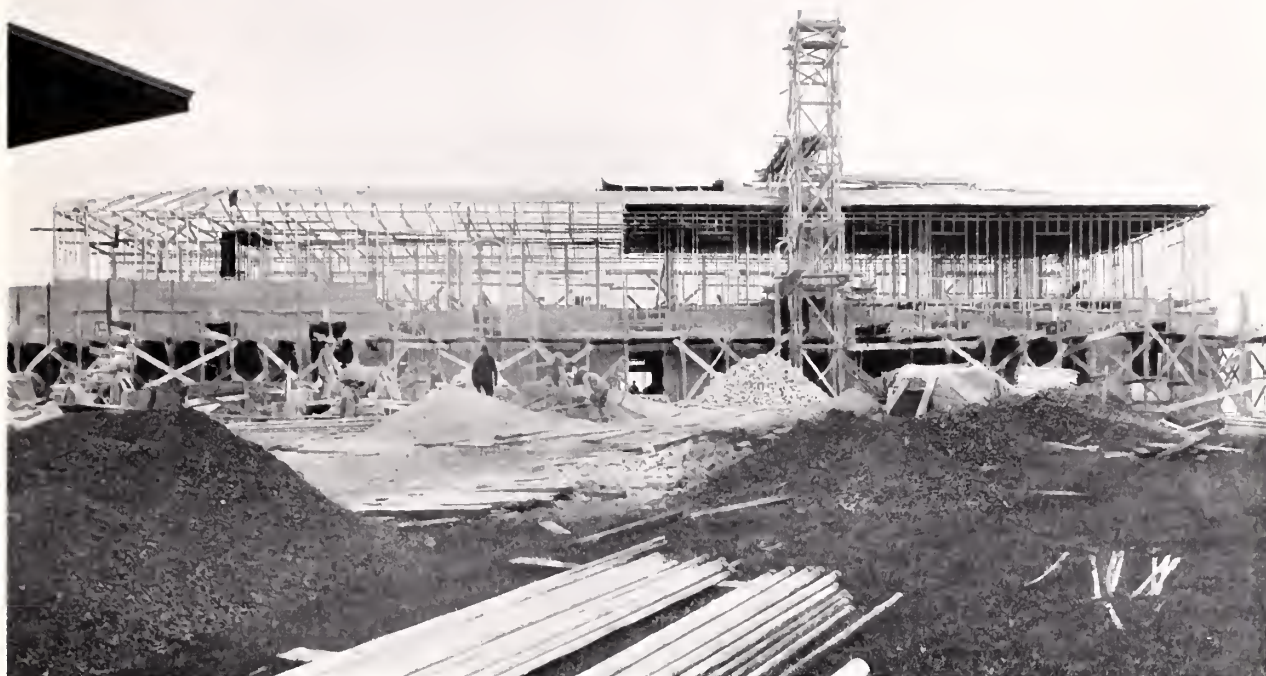
... SPECIMEN ...

PROCESS CHART FOR STEEL FRAME HOUSE ERECTION

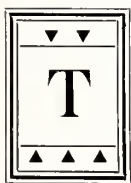
STREET		LILAC	
HOUSE NUMBER		606	
LOT NUMBER		707	
1. Excavation			
2. Footings			
3. Foundation walls			
4. Back fill			
5. STEEL FRAMING RAISED		6-1	
* Start Rough Plumbing and Heating			
6. Cement sub-floors			
7. Outside windows and doors			
8. Exterior Wall sheathing			
9. Exterior wall covering: Brick or Stone			
10. Cornice			
11. Roof sheathing			
12. Roofing and sheet metal work			
* Start First Wiring			
13. INTERIOR READY FOR LATHING		6-26	
14. Lathed			
15. PLASTERED		7-12	
16. Tile work			
17. Cement Work:			
A—Basement floors			
B—Porch floors and outside steps			
C—Walks and drives			
18. INTERIOR FINISH		8-3	
19. Hardwood floors			
20. Plumbing:			
A—Sewers			
B—ROUGHING IN (*)		6-11	
C—Gas lines			
D—Water lines			
E—Fixtures			
21. Heating:			
A—ROUGHING IN (*)		6-11	
B—Boiler set			
C—Radiation set			
22. Wiring:			
A—FIRST WIRING (*)		6-26	
B—Finished wiring			
C—Fixtures			
23. Painting:			
A—Exterior priming			
B—Exterior finish coats			
C—INTERIOR COMPLETE		8-15	
D—Decorating			
24. Landscaping			
25. COMPLETION			

NOTE: Dates set are for finishing the items noted

NOTE: Check off each item as finished in column indicated.



Arlington Club House



THE total cost of building a house with steel frame construction compares very favorably with costs for good wood framing work and offers many desirable improvements in construction not heretofore obtainable except at prohibitive cost to the average home buyer.

1. Steel framing commands insurance rates comparable with fireproof construction.
2. Steel framing removes the uncertainty of the quality of the construction throughout. Doors and windows remain adjusted and weather-tight. The structure is non-shrinkable, preventing shrinkage settlement which causes plaster to crack and fall off. Wall decoration work can be had at the time of constructing the building with the assurance that it will not be damaged by shrinkage settlement.
3. The design of the studding provides a double wall construction. There is little if any conduction from one side of the wall to the other. The dead air space is completely sealed and prevents circulation of air which then gives insulation value. The interior partition walls thus constructed are more soundproof.
4. The fuel costs for heating in steel frame house construction are much below that which prevails in the average standard construction. This has been tested in connection with temperature controlled heating plants.
5. Steel framing for house construction furnishes what we may call a steel chasis for the house that provides good engineering practice in all of the construction, and in the erection removes all the elements of chance in carrying out the architect's design in the details of story heights, window and door locations, stair space and head room, floor levels, room sizes, etc., and supplies the frame work in a very definite and durable construction in which to build all of the house.



Celotex insulating material attached

Any of the other insulating board for exterior sheathing can be securely attached to the Steel Frame work in an economical and most satisfactory manner.

AT
7450
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1929

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